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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/874,102	06/05/2001	Thomas H. Baum	272-CIP	6818

7590 06/03/2004

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EXAMINER	
OLSEN, ALLAN W	

ART UNIT	PAPER NUMBER
1763	

DATE MAILED: 06/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/874,102	BAUM ET AL.	
	Examiner	Art Unit	
	Allan Olsen	1763	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 March 2004* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-5,7-21 and 23-51* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *42-48* is/are allowed.

6)☒ Claim(s) *1,3-5,7,11-14,20,21,23-25,27,30,31,35-38,40,41 and 49-51* is/are rejected.

7)☒ Claim(s) *8-10,15-19,26,28,29,32-34 and 39* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 4, 5, 12-14, 21, 25, 30, 31, 35-38, and 51 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,575,888 issued to Kosakowski et al. (hereinafter, Kosakowski).

Kosakowski teaches etching Ir with C2F6 or SF6 (col. 2, lines 29-42). Kosakowski teaches adding H_2O to the plasma and thereby teaches adding an oxidizer comprising oxygen (col. 2, lines 29-42, 51-52, col.6, line 25). Kosakowski teaches using a remote plasma (col.2, line 63-64). Kosakowski also teaches using SiF_6, which would inherently generate SiF_2 and SiF_3 radicals when exposed to plasma conditions.

Claims 35-37 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,492,855 issued to Matsumoto et al. (hereinafter, Matsumoto).

Matsumoto teaches etching platinum with an RF plasma generated from a gas mixture comprising a halide (for example, HBr, SF_6) and oxygen from SO_2 (column 4, line 44; column 5, lines 1-20).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 4, 5, 7, 11, 14, 20, 21, 25, 27 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuller.

Fuller teaches etching noble metals with an RF plasma generated from a gas comprising a halogen-containing gas such as $CFCl_3$ (column 2, lines 48-55). Fuller teaches adding O_2 to the plasma gas (column 4, line 35).

Fuller does not explicitly teach etching an iridium-containing material. Fuller does not teach exciting the reactive gases with RF energy.

It would have been obvious to one skilled in the art to apply the method of Fuller to etch an iridium-containing material because Fuller teaches that the method is generally applicable to refractory metals and Ir is one of a small group of elements known as the refractory metals. It would have been obvious to use RF energy as an excitation source because Fuller teaches an RIE process and it is well known that the conventional means of creating the reactive ions is through the use of an RF discharge.

Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuller, as applied to claim 1 above, in view of published U.S. Patent Application 2002/00066532 of Shih et al. (hereinafter, Shih).

Fuller does not teach using a remote microwave plasma.

Shih teaches etching Ir with a remote microwave plasma (paragraph [0038]).

It would have been obvious to one skilled in the art to use a remote microwave plasma in conjunction with the method of Fuller because Shih teaches that the that with respect to IR etching, a remote microwave plasma functions as the functional equivalent of the plasma source used by Fuller.

Claims 1, 4, 5, 11, 21 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsumoto in view of Fuller.

Matsumoto's teaching, as noted above, is herein relied upon.

Matsumoto does not teach etching an Ir-containing material. Matsumoto does not teach adding and oxidizer comprising oxygen to the plasma gas.

Fuller teaches adding O_2 to the plasma gas.

It would have been obvious to one skilled in the art to apply the teaching of Matsumoto to etch an Ir-containing material because Matsumoto is directed to the etching of Pt, which is a Group VIIIB metal. Ir is also a Group VIIIB metal and, as applicant noted in their response, the Group VIIIB metals have similar chemical properties. Therefore, the skilled artisan would have a reasonable expectation of success upon adopting Matsumoto's etching method to etch an Ir-containing material.

It would have been obvious to one skilled in the art to add O_2 to the method of Matsumoto because Fuller teaches that by adding O_2 one obtains control over substrate temperature and photoresist erosion (column 4, lines 35-37) and Matsumoto's use of SO_2 demonstrates a tolerance to the of inclusion of oxygen species into the plasma.

Claims 3, 11, 23, 24, 27, 40, 41, 49 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kosakowski.

Kosakowski teaches etching Ir with C2F6 or SF6 (col. 2, lines 29-42). Kosakowski teaches using a remote plasma (col.2, line 63-64). Kosakowski also teaches using SiF_6, which would inherently generate SiF_2 and SiF_3 radicals when exposed to plasma conditions. Kosakowski teaches adding H2O to the etching process. Kosakowski teaches that the addition of water may comprise the continuous addition of water vapor to the plasma. Kosakowski teaches that the H_2O vapor may be added by any means including, for example, the introduction of ambient atmosphere. (col. 2, lines 29-42, 51-52, col.6, line 25).

Kosakowski does not teach using SiF4 as a source of SiF_2 and SiF_3. Kosakowski does not explicitly teach exposing the Ir simultaneously to the fluorocarbon etchant and O_2.

It would have been obvious to one skilled in the art to use SiF_4 because Kosakowski teaches using SiF_6 which the skilled artisan would immediately recognize as being an equivalent of SiF_4 in terms of each being a source of SiF_2 and SiF_3 radicals upon plasma excitation. It would have been obvious to one skilled in the art to use the fluorocarbon etchant at the same time as O_2 because Kosakowski teaches that water vapor may be continuously supplied to the plasma and Kosakowski teaches that the source of H_2O vapor may be air which of course would include O_2.

Response to Arguments

Applicant's arguments, see page 19 (bottom third) – page 21, line 2, filed March 3, 2004, have been fully considered and are persuasive with respect to claims 49 and 51 and the Ohnishi reference. The 102 rejection of claims 49 and 51 as being anticipated by Ohnishi is withdrawn.

Applicant's other arguments are not persuasive for the following reasons.

102 rejection based on Matsumoto

Applicant argues against a position that was not taken by the examiner. Specifically applicant recites:

"Contrary to the contention in the Office Action, 0_2 and SO_2 are entirely different chemical species with different chemical and physical properties. It is improper to assert that the presence of oxygen atoms in the SO_2 molecule qualifies the Matsumoto reference as teaching 0_2. SO_2 and O_2 are NOT the same species and are NOT interchangeable or extrapolatable from one to the other.

However, the rejection over Matsumoto does not relying upon the notion that Matsumoto's provision of SO_2 is actually a provision of O_2. The rejected claims recite "oxygen", they do not recite "O_2". The recitation of "oxygen" is considered to be broader in scope than O_2. This is especially so in view of applicant's dependent claim 11, for example, which recites "O_2" as a further limitation upon the base claim's recitation of "oxygen". As noted in applicant's response, within a 103 rejection, the previous Office action expressly states "Matsumoto does not teach adding O_2 to the plasma gas." Contrary to the contention in applicant's response, with this statement the examiner does not contradict himself in the same Office action. Applicant also argues that SO_2 does not dissociate under the plasma conditions of Matsumoto. The examiner is not

convinced that this is so and respectfully invites applicant to provide a sworn affidavit in support of their position that SO_2 does not dissociate under plasma conditions.

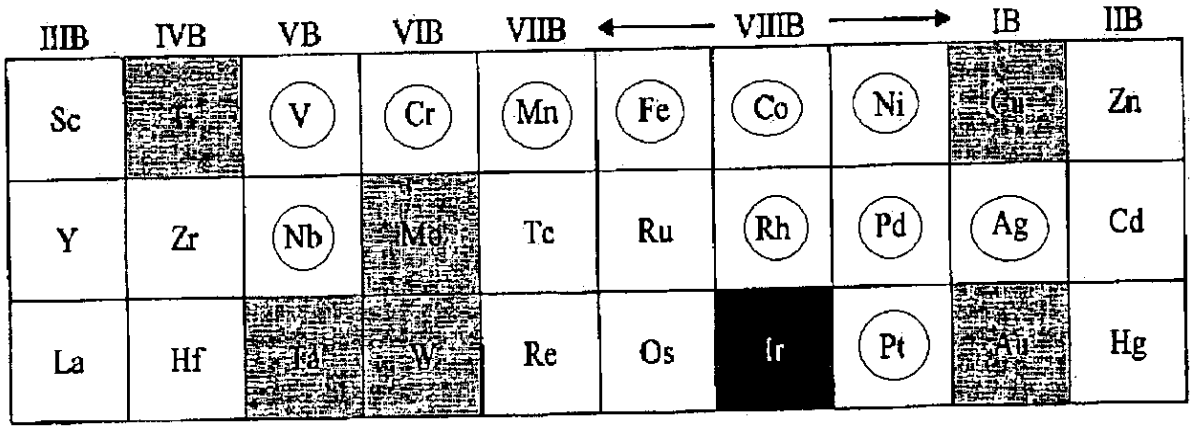
103 rejection based on Fuller:

Applicant's argues that one would not look to Fuller for guidance on etching a Group VIIIB iridium-containing film because, applicant argues, Fuller is directed to the etching of Group IB-VIIB metals. Applicant goes on to state:

"Fuller is devoid of any disclosure of etching of Group VIIIB metal compounds, including iridium-containing films".

To illustrate their point, applicant provides a figure depicting a portion of the periodic table wherein applicant has shaded those elements which they contend are disclosed by Fuller.

However, as seen below the examiner has circled the additional elements that Fuller actually discloses. Particular attention is drawn to the Fuller's disclosure pertaining to the etching of Group VIIIB metals, which applicant rightly pointed is a group of metals that are similar with regard to their chemical properties. Fuller discloses at column 6, lines 20-25 the general category of noble and refractory metals. Explicit recitation of V, Nb, Cr, Mn, Fe, Co, Ni, Rh, Pd, Pt and Ag can be found in claims 23, 24, 43 and 44.



103 rejection based on Fuller in view of Shih:

It is noted that applicant's argument pertains to a lack of motivation to change the Fuller etching composition. Applicant states:

"Given that Fuller states that the etching results were good," where is the incentive to change the Fuller etching composition? Moreover, where is the motivational basis or suggestion in Fuller for the proposition that an etching gas composition devoid of CO or CO_2, e.g., containing only halogen-based species and oxygen, will efficaciously etch a noble metal material? Clearly, there is none and as such, there is no tenable basis for the Examiner's proposed modification.

The examiner notes that the103 rejection based on Fuller in view of Shih is only concerned with incorporating Shih's use of microwave energy into the process of Fuller. The examiner did not suggest modifying the composition of Fuller in view of Shih's teaching.

Allowable Subject Matter

Claims 8-10, 15-19, 26, 28, 29, 32, 34 and 39 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 42-48 are allowed.

Conclusion

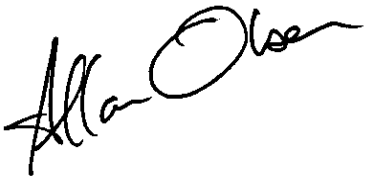
Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allan Olsen whose telephone number is 571-272-1441. The examiner can normally be reached on M-F 1-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Greg Mills can be reached on 571-272-1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Allan Olsen
Primary Examiner
Art Unit 1763